



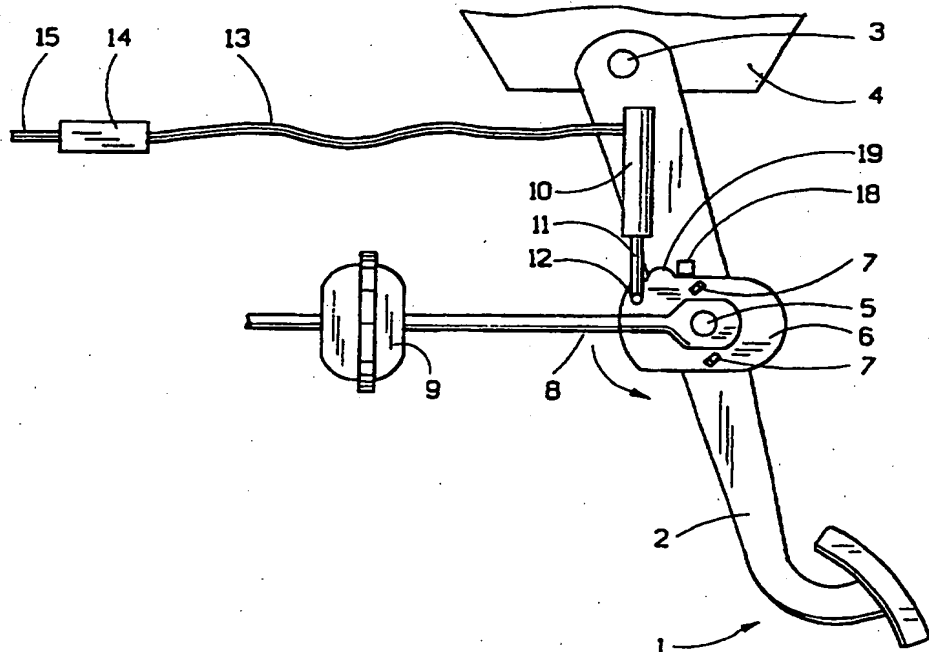
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(54) Title: METHOD FOR ACTIVATION OF A SAFETY ARRANGEMENT IN A VEHICLE

## (57) Abstract

The invention relates to an arrangement for activation of a safety arrangement in a pedal arrangement for vehicles, comprising a pedal arm (2) and a push rod (8) which connects the pedal arm (2) with means (9) arranged to act upon the pedal arm (2), actuation means (6, 7, 10; 21; 31) for releasing the push rod (8) from the pedal arm (2) and a sensor device (14, 15; 25; 37) for activation of said actuation means (6, 7, 10; 21; 31) in the case of detection of a condition generally corresponding to a collision. The invention is characterized in that said sensor device (14, 15; 25; 37) and said actuation means (6, 7, 10; 21; 31) are arranged to release the push rod (8) from the pedal arm (2) before any part of the engine of said vehicle or any other component in the engine compartment acts upon the push rod (8). The invention also relates to a method in connection with such a release of the push rod (8). By means of the invention, an improved pedal arrangement is obtained which is mainly intended for vehicles and which comprises a pedal arm, which for example forms part of a brake pedal and which can be released from a push rod in a quick and effective manner in the event of a collision.



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## TITLE:

5 Method for activation of a safety arrangement in a vehicle.

## TECHNICAL FIELD:

10 The present invention relates to an arrangement for activation of a safety device in a vehicle, according to the preamble of appended claim 1. The invention also relates to a method for such an activation, according to the preamble of appended claim 10. In particular, the invention can be applied in connection with activation of a safety device for brake pedals in motor vehicles.

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## BACKGROUND OF THE INVENTION:

20 In the field of vehicles, for example passenger cars, it is common to use brake systems which comprise a brake pedal which is connected to a push rod, which in turn is connected to the servo mechanism of the brake system, i.e. the so-called brake booster. The brake booster is normally arranged in the rear part of the engine compartment of the vehicle.

25 In the event of a head-on collision, a deformation of the front part of the vehicle normally occurs. In some cases, this deformation can be so powerful that the front part is compressed, which causes the engine and other components in the engine compartment to be pressed against the brake  
30 booster with a high force. This causes the brake booster to exert a high force upon the push rod, which in turn causes the brake pedal to impart a short but intensive blow on the foot of the driver, before any deformation of the firewall takes place. In this manner, the pedal is caused to pivot  
35 into the passenger compartment of the vehicle in a direction towards the driver. This is a severe problem since the brake pedal might cause serious injuries to the feet and legs of the driver.

A previously known brake pedal arrangement which is intended to solve this problem is known from the Swedish patent SE 465769. This arrangement comprises a push rod which is pivotally arranged in the brake pedal arm and which is designed with a twisted part which can interact with side edges of the brake pedal arm. If the brake pedal arm (being, for example, affected by the brake booster in a collision) is pivoted more than a certain angle in relation to the push rod, the twisted part will affect the brake pedal arm so as to displace the push rod axially in a direction away from the pedal arm. In this manner, the push rod can be released from the brake pedal arm in the event of a collision.

Although this previously known arrangement functions satisfactorily in most types of collisions, there is a need to control the releasing of the push rod from the brake pedal arm in a more active manner, for example so that it can be released even if the push rod has not been pivoted a predetermined angle in relation to the brake pedal arm. In this manner, the releasing of the brake pedal from the push rod might take place at an earlier stage during a collision, which would provide improved protection against feet and leg injuries.

Another known arrangement of a similar kind is shown in EP 0 659 615. This arrangement comprises a pedal suspension with two arms, between which a pedal is pivotally suspended about a shaft. Each arm comprises a deformable part with a bearing in which said shaft is suspended. If the arrangement is affected by a predetermined force, the bearings will be detached from the shaft and the brake pedal is released. However, this known arrangement implies a drawback in that it will not be activated until the drivetrain of the vehicle has begun to penetrate the firewall.

## SUMMARY OF THE INVENTION:

Consequently, a main object of the present invention is to solve the above-mentioned problems and to provide an improved arrangement which is mainly intended for vehicles and which provides a quick and effective release of a brake pedal from a push rod in the event of a collision. In particular, the releasing must take place before any part of the drive line of the vehicle has come into contact with the brake booster.

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This object is achieved by an arrangement of the kind mentioned initially, the characterizing features of which will become apparent from subsequent claim 1. The object is also achieved by a method of the kind mentioned initially, the characterizing features of which will become apparent from subsequent claim 10.

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The arrangement according to the invention comprises actuation means for releasing the push rod from the pedal arm and a sensor device for activation of said actuation means in case of detection of a condition generally corresponding to a collision. In accordance with the invention, the sensor device and the actuation means are arranged to release the push rod from the pedal arm before any part of the engine of said vehicle or any other part in the engine compartment acts upon the push rod. In this way, a quick and effective release of the push rod from the brake pedal arm in the event of a collision is obtained.

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Furthermore, according to the invention a pedal arrangement comprising a pedal arm with a shaft and a particular pivoting element are provided. The pivoting element is pivotally arranged on the pedal arm and also comprises at least one cam surface which can cooperate with the push rod. The invention further comprises actuatable means, by means of which the pivoting element can be forced to pivot

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so that the cam surface of the pivoting element causes the push rod to be displaced out of engagement with the shaft. In this manner, the push rod can be released from the pedal arm before any part of the engine of said vehicle or any other part in the engine compartment can act upon the push rod, which provides quick and effective releasing of the push rod from the brake pedal arm should a collision occur.

According to a particular embodiment, the invention comprises a sensor device which is arranged to activate the pivoting element to be pivoted about the shaft. According to this embodiment, the sensor device is constituted by a hydraulic cylinder which can affect another hydraulic cylinder so that the latter one pivots the pivoting element about the shaft. According to yet another embodiment, the sensor device is constituted by a wire which is biased by means of a spring. This spring can be released so that the wire causes the pivoting element to pivot, by means of the force of the spring.

#### BRIEF DESCRIPTION OF THE FIGURES:

The invention will be described in the following in greater detail with reference to the appended drawings, in which

Fig. 1 is a schematic side view of a pedal arrangement according to a first embodiment, which can be used in the present invention,

Fig. 2 is a partially enlarged front view of the arrangement of Fig. 1,

Fig 3 is a schematic side view of a pedal arrangement intended for the invention, according to a second embodiment,

Fig. 4 is an end view of a sensor arrangement which can be used in the embodiment according to Fig. 3,

5 Fig. 5 is a schematic side view of a pedal arrangement according to a further embodiment, and

Fig. 6 is a simplified top view of a vehicle, illustrating the function of the invention.

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#### PREFERRED EMBODIMENTS:

Fig. 1 shows a schematic side view of a pedal arrangement which can be used in the present invention. The pedal arrangement comprises a brake pedal 1 with a brake pedal arm 2 which is pivotally arranged about a shaft 3 in a console 4. In a manner which is conventional, the console 4 is arranged on the underside of a dashboard (not shown) of a vehicle, for example a passenger car.

20 The pedal arm 2 comprises an aperture which supports a further shaft 5. A pivotable element in the form of a plate 6 is pivotally arranged on the shaft 5 and comprises at least one, preferably two, tongues 7 which protrude in an essentially perpendicular direction from the plate 6, and  
25 which are slightly oblique in relation to the horizontal plane. The design and function of the tongues 7 will be described in detail below. On the outside of the plate 6, a push rod 8 is pivotally arranged on the shaft 5. The push rod 8, which preferably is made from a flat iron, is  
30 connected to the brake system of the vehicle, to be more precise to its brake booster 9. The other parts of the brake system are of conventional kind and for this reason they will not be described in detail here. The push rod 8 and the plate 6 are held in place in the normal condition,  
35 as shown in Fig. 1, by means of a locking washer (not

shown) or the like, which is arranged at the outermost position on the shaft 5.

5 Furthermore, a first cylinder 10 is arranged on the pedal arm 2. The first cylinder 10 is preferably of the hydraulic kind and comprises a piston (not shown) and a rod 11 which can be affected so as to protrude out of the cylinder 10 if hydraulic liquid under pressure exists in the cylinder 10. The rod 11 is pivotally attached to an attachment point 12  
10 in the plate 6.

A conduit 13 for hydraulic fluid is arranged between the first cylinder 10 and a second cylinder 14. According to the embodiment, the second cylinder 14 is arranged to  
15 function as a collision sensor. To this end, it is arranged in the front part of the vehicle. The second cylinder 14 comprises a rod 15 which, when depressed, affects a piston (not shown) so as to force hydraulic liquid in the direction towards the conduit 14 and the first cylinder 10.  
20

The second cylinder 14 is arranged in the vehicle in such a way that deformation of the vehicle in the event of a head-on collision will cause the rod 15 to be depressed. In this manner, hydraulic liquid is fed through the conduit 13  
25 and into the first cylinder 10. This causes the rod 11 of the first cylinder 10 to protrude a certain distance. In turn, this causes the plate 6 to pivot a certain angle in the counter-clockwise direction, i.e. in the direction indicated with an arrow in Fig. 1. The arrangement of the  
30 second cylinder 14 in a vehicle will be described in detail below.

With reference to Fig. 2 in which the shaft 5, the plate 6, the tongues 7 and the push rod 8 are shown slightly enlarged for reasons of clarity, it will now be realised  
35 that when the plate 6 is pivoted as has been described



above, the tongues 7 will come into contact with the push rod 8. In this way, the tongues 7 will cause the push rod 8 to be displaced in an axial direction away from the plate 6, i.e. to the left as shown in Fig. 2. In order for the  
5 tongues 7 to be able to push the push rod 8 in an axial direction, the tongues are so arranged so that they protrude in a mainly perpendicular direction from the plate 6, i.e. in the direction of the push rod 8. Furthermore,  
10 each of the tongues has an edge 16 which is rounded, oblique, or shaped in a corresponding manner, which edge will come into contact with the push rod 8, preferably with the corner edges 17 thereof, when the plate is pivoted as described above. When the push rod 8 has been displaced far enough axially to the left, it will fall off the shaft 5.  
15 In this manner, the push rod 8 is released from the pedal arm 2.

As will be described in detail below, the second cylinder 14 is arranged in such a manner in the vehicle that it will  
20 be affected by a deformation of the front part of the vehicle at an optimally chosen point in time during a collision. In particular, the first cylinder 10 can be activated so that the push rod 8 is released from the brake pedal arm 2 at such an early stage of a collision that the  
25 push rod 8 does not transfer any force to the brake pedal 1.

With reference to Figs. 1 and 2, it can be seen that the brake pedal arm 2 is provided with a protrusion 18 which  
30 protrudes from the brake pedal 2 and serves as a stop which interacts with a protruding part 19 of the plate 6. In this way, the plate 6 is prevented from pivoting too far in the clockwise direction (see Fig. 1).

35 Fig. 3 is a schematic side view of a pedal arrangement according to a second embodiment. The parts which

correspond to that which is shown in Figs. 1 and 2 are denoted with the same reference numerals in Fig. 3. The main difference between the two embodiments is that the embodiment shown in Fig. 3 employs a mechanical power transmission for pivoting the plate 6, whereas the embodiment shown in Figs. 1 and 2 utilizes a hydraulic power transmission for pivoting the plate 6.

According to the embodiment shown in Fig. 3, the plate 6 is provided with an attachment 20 in which a wire 21 is arranged. The wire 21 is constituted by the inner cable of a mechanical cable 22, the outer sheath 23 of which is fixed to the brake pedal arm 2 by means of a clamp 24 or the like. Furthermore, the cable 22 is connected to a sensor device 25 which is preferably accommodated in a cylindrically shaped body. The outer sheath 23 of the cable 22 is fixed on one of the end walls of the sensor device 25, i.e. the end wall 26, whereas the inner wire 21 extends into the sensor device 25. Furthermore, the inner wire 21 is fixed to a holding plate 27 which can be displaced longitudinally in the sensor device 25. Between the holding plate 27 and the end surface 26, a spring 28 is arranged, which spring is biased so that it acts upon the inner wire 21 in a direction inwards into the sensor device 25, i.e. to the left in Fig. 3. The holding plate 27 is held in place by means of a yoke 29 which preferably is U-shaped and the legs of which extend through the wall of the sensor device 25. In its assembled condition, the yoke 29 prevents the holding plate 27 from being displaced to the left, i.e. the yoke 29 acts to maintain the spring 28 in its biased state.

The sensor device 25 is shown in an end view in Fig. 4, in which the position of the yoke 29 can be seen more clearly.

According to the embodiment, the yoke 29 is arranged so that it can be pushed out of the sensor device 25 in the event of a collision. To this end, the yoke 29 is preferably connected to a bar 30 which is so arranged that, when affected in the direction indicated by means of an arrow in Fig. 4, it will cause the yoke 29 to be displaced out of the sensor device 25. The bar 30 is preferably arranged at a position in the front part of the vehicle, so that in the event of a collision, i.e. a deformation of the front part, it will be displaced longitudinally. This causes the yoke 29 to be brought out of engagement with the sensor device 25.

Fig. 5 shows a further embodiment of the invention, which comprises a pretensioning device 31 of the kind which is normally used to tighten a seat belt in the event of a collision. The pretensioning device 31 is fixed on the brake pedal arm 2 by means of a clamp 32 or the like.

Inside the pretensioning device 31, a piston 33 is arranged, which piston is connected to a bar 34 or a wire, depending on the type of assembly. In the first case, the bar 34 is in turn connected to the plate 6 via an attachment 35. Furthermore, inside the pretensioning device 31 a powder charge 36 is arranged, which charge can be ignited by means of a triggering device (not shown). In this case, the piston 33 will be caused to move upwards, thereby pulling the bar 34 upwards. This causes the plate 6 to rotate a certain amount in the counter-clockwise direction, thereby releasing the push bar 8 from the shaft 5, as has been described above.

The pretensioning device 31 is connected to a sensor device 37 via a connector 38. The sensor device 37 is preferably of a type which is used as an acceleration sensor which detects severe braking of the vehicle. Preferably, the

invention uses the same kind of sensor which is utilized to trigger an airbag used in vehicles to protect the occupants. The sensor device 37 is preferably arranged inside the passenger compartment of the vehicle, for example in connection to the vehicle's gear lever.

Fig. 6 shows a simplified top view of a vehicle 39 in which the present invention can be used. The drawing shows an intended position for the engine 40 of the vehicle 39 and a zone 41 in the vehicle 39 within which the sensor device, being arranged to activate the release of the push bar from the brake pedal arm, can be arranged. The term "sensor device" here refers to the second cylinder 14 with its corresponding rod 15 (according to the embodiment shown in Figs. 1 and 2) or the sensor device 25 with its yoke 29 (in the embodiment shown in Figs. 3 and 4). The sensor device 37 according to Fig. 5 can be placed anywhere in the vehicle since it is an acceleration sensor.

As regards the position of the zone 41, it starts at a certain distance  $l_1$  as seen from the front bumper of the vehicle 39. This means that there will be a certain "delay" as regards the activation of the sensor device, i.e. from the instant that a collision takes place. This delay, which in the event of a collision corresponds to the time it takes until the deformation of the front part of the vehicle reaches the sensor, is normally approximately 20-40 ms, preferably approximately 30 ms. This corresponds to a distance  $l_1$  from the front edge of the vehicle 39 of approximately 30 cm. In a corresponding manner, the release of the brake pedal arm from the push rod must not take place too late. For this reason, the zone 41 is limited in the longitudinal direction of the vehicle 39 by a certain distance  $l_2$  from the front edge of the vehicle 39, which distance  $l_2$  is approximately 45 cm. Obviously, these distances,  $l_1$  and  $l_2$ , vary according to the size of the

vehicle and the engine compartment - the example refers to a large family car.

5 A preferred position for a sensor device is shown with the reference numeral 42 in Fig. 6. A further possible position for the sensor device is shown with the reference numeral 43. The latter position is possible since the engine 40 then will constitute a rigid body, by means of which the zone 41 is extended in the longitudinal direction of the vehicle 39. In this manner, the zone 41 can be said to provide an effective extension a certain distance behind the engine 40. Other rigid bodies in the engine compartment of the vehicle 39 which are positioned in front of the sensor device also function so as "extend" the limitation of the zone 41.

Furthermore, the vehicle 39 should preferably be travelling with a predetermined minimum collision speed in order to allow the release of the brake pedal from the push bar at all. This speed is preferably 15 mph (24 km/h). This means that the sensor device and the vehicle must be arranged so that collisions at lower speeds than the above-mentioned limit will cause a deformation which does not reach the sensor device so that it triggers the release of the brake pedal arm.

The invention is not limited to the described embodiments, but may be varied within the scope of the appended claims. For example, the edges 16 of the tongues 7 can be shaped in different ways, and can be curve-shaped, alternatively be slightly or highly oblique in relation to the plane of the plate 6.

It should also be noted that although the invention has been described in connection with a brake pedal, it can also be utilized in other kinds of pedals.

Furthermore, the sensor device which is used (i.e. the second cylinder 13 or the sensor device 25) is preferably positioned so as to be triggered both in the event of a head-on collision and in the event of a so called "offset" collision, i.e. a collision where a vehicle collides so that its front part is somewhat displaced sideways in relation to its position in a head-on collision. In order for the sensor device to trigger in the event of an offset collision, it is normally necessary to position it at one of the front edges of the vehicle.

The first cylinder 10 (see Fig. 1) can be arranged either on the brake pedal arm 2 or on the shaft 3 about which the brake pedal arm 2 can be pivoted.

The above-mentioned pedal arrangements shown in Figs. 1-5, which comprise means to release the push bar 8 from the pedal arm 2, are only examples of such arrangements. Other similar pedal arrangements are possible within the scope of the invention, for example an electrical solution where a solenoid is activated by a sensor and pushes the push rod away so as to release it from the pedal arm, or a pyrotechnical solution according to the SIPS principle, wherein an ignition device in the engine compartment, for example in front of the wheelhousing on the drivers' side, triggers a pretensioning device via a fuse, so that the pretensioning device releases the push bar.

## 5 CLAIMS:

1. An arrangement for activation of a safety device in a pedal arrangement for vehicles, comprising a pedal arm (2), a push rod (8) which connects the pedal arm (2) with means  
10 (9) arranged to be acted upon by the pedal arm (2), actuation means (6, 7, 10; 21; 31) for releasing the push rod (8) from the pedal arm (2), and a sensor device (14, 15; 25; 27) for activation of said actuation means (6, 7, 10; 21; 31;) in case of detection of a condition generally  
15 corresponding to a collision, c h a r a c t e r i z e d i n that said sensor device (14, 15; 25; 27) and said actuation means (6, 7, 10; 21; 31) are arranged so as to release the push rod (8) from the pedal arm (2) before any part of the engine of said vehicle or any other part in the  
20 engine compartment acts upon the push rod (8).

2. Arrangement according to claim 1, c h a r a c t e - r i z e d i n that the sensor device (14, 15; 25) is arranged within a zone (41) in the front part of the  
25 vehicle (39), within which zone deformation occurs in the event of a head-on or offset collision at a speed which is higher than a predetermined value, which deformation activates the sensor device (14, 15; 25).

3. Arrangement according to claim 2, c h a r a c t e - r i z e d i n that the sensor device (14, 15; 25) is arranged within an interval, as seen from the front edge of the vehicle (39), between a first distance ( $l_1$ ) and a second distance ( $l_2$ ), said first distance ( $l_1$ ) and/or second  
35 distance ( $l_2$ ) being extended according to the dimensions of rigid bodies arranged in the front part of the vehicle (39), in front of the sensor device (14, 15; 25).

4. Arrangement according to any one of claims 1-3, characterized in that said sensor device (14, 15) comprises a hydraulic cylinder device which, when mechanically affected, activates said actuation means (6, 7, 10).

5. Arrangement according to any one of claims 1-3, characterized in that said sensor device (25) comprises a spring element (28) which is connected to a wire (22) and is biased in a position which is limited by a yoke element (29), and that the yoke element (29) is arranged to be displaced so as to release the spring element (28) when mechanically acted upon, the cable (22) being acted upon by a tractive force from the spring element (28) in order to activate said actuation means (6, 7, 21).

6. Arrangement according to any one of the previous claims, characterized in that said means (6, 7) for releasing the push rod (8) comprises a pivoting element (6) which is pivotally arranged on said pedal arm (2) and which is provided with at least one cam surface (16) for interacting with at least one opposing surface (17) of said push rod (8), and in that said actuation means (10-15; 20-27; 31), is arranged for pivoting said pivoting element (6) when said sensor means (14, 15; 25; 37) is activated, whereby the cam surface (16) affects said push rod (8) to be moved out of engagement with said shaft (5).

7. Arrangement according to claim 6, characterized in that the pivoting element (6) is arranged on said shaft (5) between the pedal arm (2) and the push rod (8), the pivoting element (6), when activated, causing the push rod (8) to be displaced axially out of engagement with said shaft (5).



8. Arrangement according to claim 6 or 7, c h a r a c t e -  
r i z e d i n that said cam surface (16) is formed on a  
tongue-shaped element (7) on the pivoting element (6), the  
tongue-shaped element (7) protruding in an essentially  
5 perpendicular direction from the pivoting element (6).

9. Arrangement according to claim 1, c h a r a c t e -  
r i z e d i n that said sensor device (37) is constituted  
by an acceleration sensor and that said actuation means  
10 (31) comprises a pyrotechnically actuated pretensioning  
unit.

10. A method for activation of a safety device in a pedal  
arrangement for vehicles, comprising a pedal arm (2) and a  
15 push rod (8) which connects the pedal arm (2) with means  
(9) arranged to be acted upon by the pedal arm (2),  
comprising:

detection of a condition generally corresponding to  
a collision, by means of a sensor device (14, 15; 25; 37),  
20 activation of an actuation means (6, 7, 10; 21; 31)  
when the sensor device (14, 15; 27; 37) is activated,  
whereby said actuation means (6, 7, 10; 21) releases the  
push rod (8) from the pedal arm (2),  
c h a r a c t e r i z e d i n that said activation is  
25 carried out before any part of the engine of said vehicle  
or any other part in the engine compartment acts upon the  
push rod (8).

11. Safety arrangement in a pedal arrangement for motor  
30 vehicles, comprising a console (4), a pedal arm (2) which  
is pivotally arranged in the console (4), and a push rod  
(8) which connects the pedal arm (2) with means (9)  
arranged to be acted upon by the pedal arm (2) and which is  
pivotally arranged on a shaft (5) arranged on the pedal arm  
35 (2), c h a r a c t e r i z e d i n that it comprises a  
pivoting element (6) which is pivotally arranged on said

pedal arm (2) and is provided with at least one cam surface (16) for interaction with at least one opposing surface (17) on said push rod (8), and actuation means (10-15; 20-27) which when activated is arranged to pivot said pivoting element (6), whereby the cam surface (16) causes said push rod (8) to be moved out of engagement with said shaft (5) before any part of the engine of said vehicle or any other part in the engine compartment affects the push rod (8).

10 12. Arrangement according to claim 11, c h a r a c t e -  
r i z e d i n that the pivoting element (6) is arranged  
on said shaft (5) between the pedal arm (2) and the push  
rod (8), whereby the pivoting element (6) when activated  
15 affects the push rod (8) to be axially displaced out of  
engagement with said shaft (5).

13. Arrangement according to claim 11 or 12, c h a r a c -  
t e r i z e d i n that said cam surface (16) is formed on  
a tongue-shaped element (7) on the pivoting element (6),  
20 the tongue-shaped element (7) protruding in an essentially  
perpendicular direction from the pivoting element (6).

14. Arrangement according to any one of claims 11-13,  
c h a r a c t e r i z e d i n that it comprises a sensor  
25 device (14, 15; 25; 37) for detection of a predetermined  
condition in which said pivoting element (6) is activated  
so as to be pivoted.

15. Arrangement according to claim 14, c h a r a c t e -  
r i z e d i n that it comprises a first hydraulic  
30 cylinder device (10, 11) which is connected to the pivoting  
element (6) and is arranged to cause the pivoting element  
(6) to pivot in a predetermined direction in the event of  
detection of said condition by means of the sensor device  
35 (14, 15).

16. Arrangement according to claim 14, c h a r a c t e -  
r i z e d i n that the sensor device (14, 15) is  
constituted by a second hydraulic cylinder device which  
when mechanically affected actuates said first hydraulic  
cylinder device (10, 11).

17. Arrangement according to claim 14, c h a r a c t e -  
r i z e d i n that said pivoting element (6) is connected  
to a mechanical cable (22) which is arranged to be acted  
upon by a tractive force in the event of detection of said  
condition by means of the sensor device (25).

18. Arrangement according to claim 17, c h a r a c t e -  
r i z e d i n that said sensor device (25) comprises a  
spring element (28) which is connected to the cable (22)  
and which is biased in a position which is limited by a  
yoke element (29), the yoke element (29) being arranged to  
be displaced so as to release the spring element (28) if  
mechanically acted upon, whereby the cable (22) is affected  
by a tractive force from the spring element (28).

19. Arrangement according to claim 14, c h a r a c t e -  
r i z e d i n that the sensor device (37) is constituted  
by an acceleration sensor which is connected to a pre-  
tensioning device (31) which is arranged in connection with  
said pivoting element (6) and is arranged to affect the  
pivoting element (6) in a predetermined direction in the  
event of detection of said condition by means of the sensor  
device (37).

20. Arrangement according to any one of claims 11-19,  
c h a r a c t e r i z e d i n that said cam surface (16)  
is curve-shaped or oblique in relation to the plane of the  
pivoting element (6).

21. Vehicle comprising an arrangement according to any one of claims 11-20, characterized in that said sensor device (14, 15; 25) is arranged within a zone (41) in the front part of the vehicle in which a deformation takes place in the event of a head-on collision at a speed which exceeds a predetermined value.

22. A method in a pedal arrangement in motor vehicles comprising a console (4), a pedal arm (2) which is pivotally arranged in the console (4), and a push rod (8) which connects the pedal arm (2) with means (9) arranged to be influenced by the pedal arm (2) and which is pivotally arranged on a shaft (5) arranged on the pedal arm (2), characterized in that it comprises the following steps:

activating an actuation means (10-5; 20-27; 31-38), pivoting a pivoting element (6) in the event of said activation, the pivoting element (6) being pivotally arranged on said pedal arm (2) and being provided with at least one cam surface (16) for interaction with at least one opposing surface (17) on said push rod (18), and

guiding the cam surface (16) so that it causes said push rod (8) to be moved out of engagement with said shaft (5) before any part of the engine of said vehicle or any other component in the engine compartment affects the push rod (8).

## AMENDED CLAIMS

[received by the International Bureau on 30 May 1997 (30.05.97);  
original claims 1-22 replaced by amended claims 1-20 (6 pages)]

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1. An arrangement for activation of a safety device in a pedal arrangement for vehicles, comprising a pedal arm (2), a push rod (8) which connects the pedal arm (2) with means (9) arranged to act upon the pedal arm (2), actuation means (6, 7, 10; 21; 31) for releasing the push rod (8) from the pedal arm (2), and a sensor device (14, 15; 25; 42; 43) for activation of said actuation means (6, 7, 10; 21; 31;) in the case of detection of a condition generally corresponding to a collision, said sensor device (14, 15; 25; 42; 43) and said actuation means (6, 7, 10; 21; 31) being arranged to release the push rod (8) from the pedal arm (2) before any part of the engine of said vehicle or any other part in the engine compartment acts upon the push rod (8), c h a r a c t e r i z e d i n that the sensor device (14, 15; 25; 42; 43) is arranged within a zone (41) in the front part of the vehicle (39), the extension of the zone (41) being defined between a first distance ( $l_1$ ) and a second distance ( $l_2$ ), as seen from the front edge of the vehicle (39), and within which zone (41) a deformation occurs in the event of a head-on or offset collision with a speed which is higher than a predetermined value, which deformation activates the sensor device (14, 15; 25; 42; 43), the values of said first and second distances ( $l_1$ ,  $l_2$ ) being chosen so as to correspond to a predetermined minimum time delay and maximum time delay, respectively, for the activation of the sensor device (14, 15; 25; 42; 43) as a result of said deformation.
2. Arrangement according to claim 1, c h a r a c t e - r i z e d i n that said first distance ( $l_1$ ) and/or said second distance ( $l_2$ ) will be extended according to the dimensions of rigid bodies arranged in the front part of

the vehicle (39), in front of the sensor device (14, 15; 25).

5 3. Arrangement according to any one of claim 1 or 2, characterized in that said sensor device (14, 15) comprises a hydraulic cylinder device which, when mechanically affected, activates said actuation means (6, 7, 10).

10 4. Arrangement according to any one of claim 1 or 2, characterized in that said sensor device (25) comprises a spring element (28) which is connected to a wire (22) and is biased in a position which is limited by a yoke element (29), and that the yoke element (29) is  
15 arranged to be displaced so as to release the spring element (28) when mechanically acted upon, the cable (22) being acted upon by a tractive force from the spring element (28) in order to activate said actuation means (6, 7, 21).

20 5. Arrangement according to any one of the previous claims, characterized in that said means (6, 7) for releasing the push rod (8) comprises a pivoting element (6) which is pivotally arranged on said pedal arm (2) and which  
25 is provided with at least one cam surface (16) for interacting with at least one opposing surface (17) of said push rod (8), and in that said actuation means (10-15; 20-27; 31), is arranged for pivoting said pivoting element (6) when said sensor means (14, 15; 25; 37) is activated, whereby the cam surface (16) affects said push rod (8) to  
30 be moved out of engagement with said shaft (5).

35 6. Arrangement according to claim 5, characterized in that the pivoting element (6) is arranged on said shaft (5) between the pedal arm (2) and the push rod (8), the pivoting element (6), when activated, causing

the push rod (8) to be displaced axially out of engagement with said shaft (5).

5 7. Arrangement according to claim 5 or 6, c h a r a c t e -  
r i z e d i n that said cam surface (16) is formed on a  
tongue-shaped element (7) on the pivoting element (6), the  
tongue-shaped element (7) protruding in an essentially  
perpendicular direction from the pivoting element (6).

10 8. A method for activation of a safety device in a pedal  
arrangement for vehicles, comprising a pedal arm (2) and a  
push rod (8) which connects the pedal arm (2) with means  
(9) arranged to act upon the pedal arm (2), comprising:

15 detection of a condition generally corresponding to  
a collision, by means of a sensor device (14, 15; 25; 42;  
43),

20 activation of actuation means (6, 7, 10; 21; 31) when  
the sensor device (14, 15; 27; 42; 43) is activated, said  
actuation means (6, 7, 10; 21) releasing the push rod (8)  
from the pedal arm (2) before any part of the engine of  
said vehicle or any other part in the engine compartment  
acts upon the push rod (8), c h a r a c t e r i z e d i n  
that said actuation of the sensor device (14, 15; 25; 42;  
43) is carried out with a predetermined time delay, the  
25 value of which is defined by arranging the sensor device  
(14, 15; 25; 42; 43) within a zone (41) in the front part  
of the vehicle (39), the extension of the zone (41) being  
defined between a first distance ( $l_1$ ) and a second distance  
( $l_2$ ), as seen from the front edge of the vehicle (39), and  
30 within which zone (41) a deformation occurs in the event of  
a head-on or offset collision with a speed which is higher  
than a predetermined value, which deformation activates the  
sensor device (14, 15; 25; 42; 43), the value of said time  
delay being within an interval, the maximum value and  
35 minimum value of which corresponding to said first and  
second distances ( $l_1$ ,  $l_2$ ).

5 9. Safety arrangement in a pedal arrangement for motor vehicles, comprising a console (4), a pedal arm (2) which is pivotally arranged in the console (4), and a push rod (8) which connects the pedal arm (2) with means (9) arranged to influence the pedal arm (2) and which is pivotally arranged on a shaft (5) arranged on the pedal arm (2), c h a r a c t e r i z e d i n that it comprises a pivoting element (6) which is pivotally arranged on said pedal arm (2) and provided with at least one cam surface (16) for interaction with at least one opposing surface (17) on said push rod (8), and actuation means (10-15; 20-27) which when activated is arranged to pivot said pivoting element (6), whereby the cam surface (16) causes said push rod (8) to be moved out of engagement with said shaft (5) before any part of the engine of said vehicle or any other part in the engine compartment affects the push rod (8).

10 10. Arrangement according to claim 9, c h a r a c t e r i z e d i n that the pivoting element (6) is arranged on said shaft (5) between the pedal arm (2) and the push rod (8), whereby the pivoting element (6) when activated affects the push rod (8) to be axially displaced out of engagement with said shaft (5).

25 11. Arrangement according to claim 9 or 10, c h a r a c t e r i z e d i n that said cam surface (16) is formed on a tongue-shaped element (7) on the pivoting element (6), the tongue-shaped element (7) protruding in an essentially perpendicular direction from the pivoting element (6).

30 12. Arrangement according to any one of claims 9-11, c h a r a c t e r i z e d i n that it comprises a sensor device (14, 15; 25; 37) for detection of a predetermined condition in which said pivoting element (6) is activated to be pivoted.



13. Arrangement according to claim 12, c h a r a c t e -  
r i z e d i n that it comprises a first hydraulic  
cylinder device (10, 11) which is connected to the pivoting  
element (6) and is arranged to cause the pivoting element  
5 (6) to pivot in a predetermined direction in the event of  
detection of said condition by means of the sensor device  
(14, 15).

14. Arrangement according to claim 13, c h a r a c t e -  
10 r i z e d i n that the sensor device (14, 15) is  
constituted by a second hydraulic cylinder device which  
when mechanically affected actuates said first hydraulic  
cylinder device (10, 11).

15. Arrangement according to claim 12, c h a r a c t e -  
15 r i z e d i n that said pivoting element (6) is connected  
to a mechanical cable (22) which is arranged to be affected  
by a tractive force in the event of detection of said  
condition by means of the sensor device (25).

20 16. Arrangement according to claim 15, c h a r a c t e -  
r i z e d i n that said sensor device (25) comprises a  
spring element (28) which is connected to the cable (22)  
and which is biased in a position which is limited by a  
25 yoke element (29), the yoke element (29) being arranged to  
be displaced and release the spring element (28) if  
mechanically acted upon, whereby the cable (22) is affected  
by a tractive force from the spring element (28).

30 17. Arrangement according to claim 12, c h a r a c t e -  
r i z e d i n that the sensor device (37) is constituted  
by an acceleration sensor which is connected to a pre-  
tensioning device (31) which is arranged in connection with  
said pivoting element (6) and is arranged to affect the  
35 pivoting element (6) in a predetermined direction in the

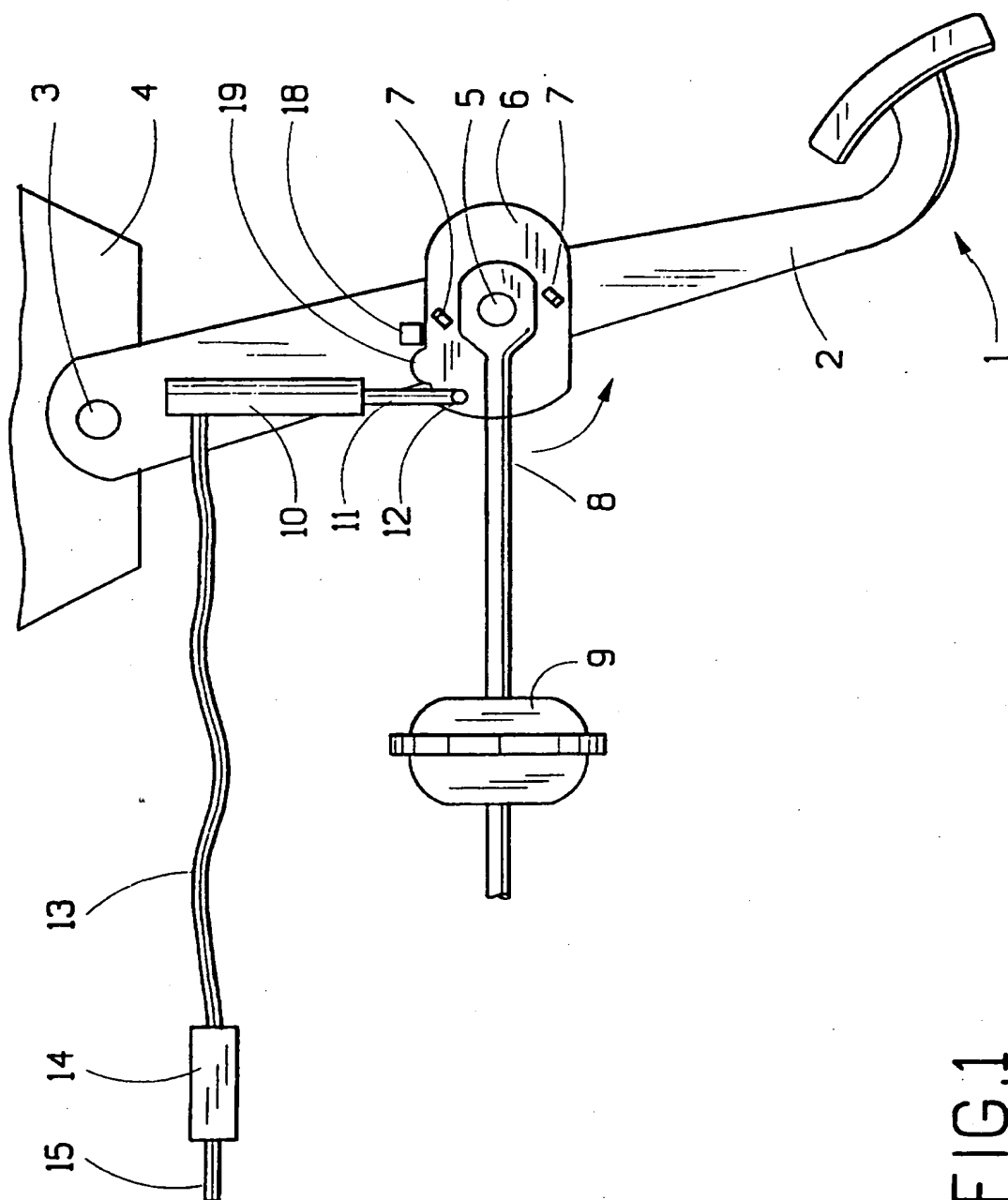
event of detection of said condition by means of the sensor device (37).

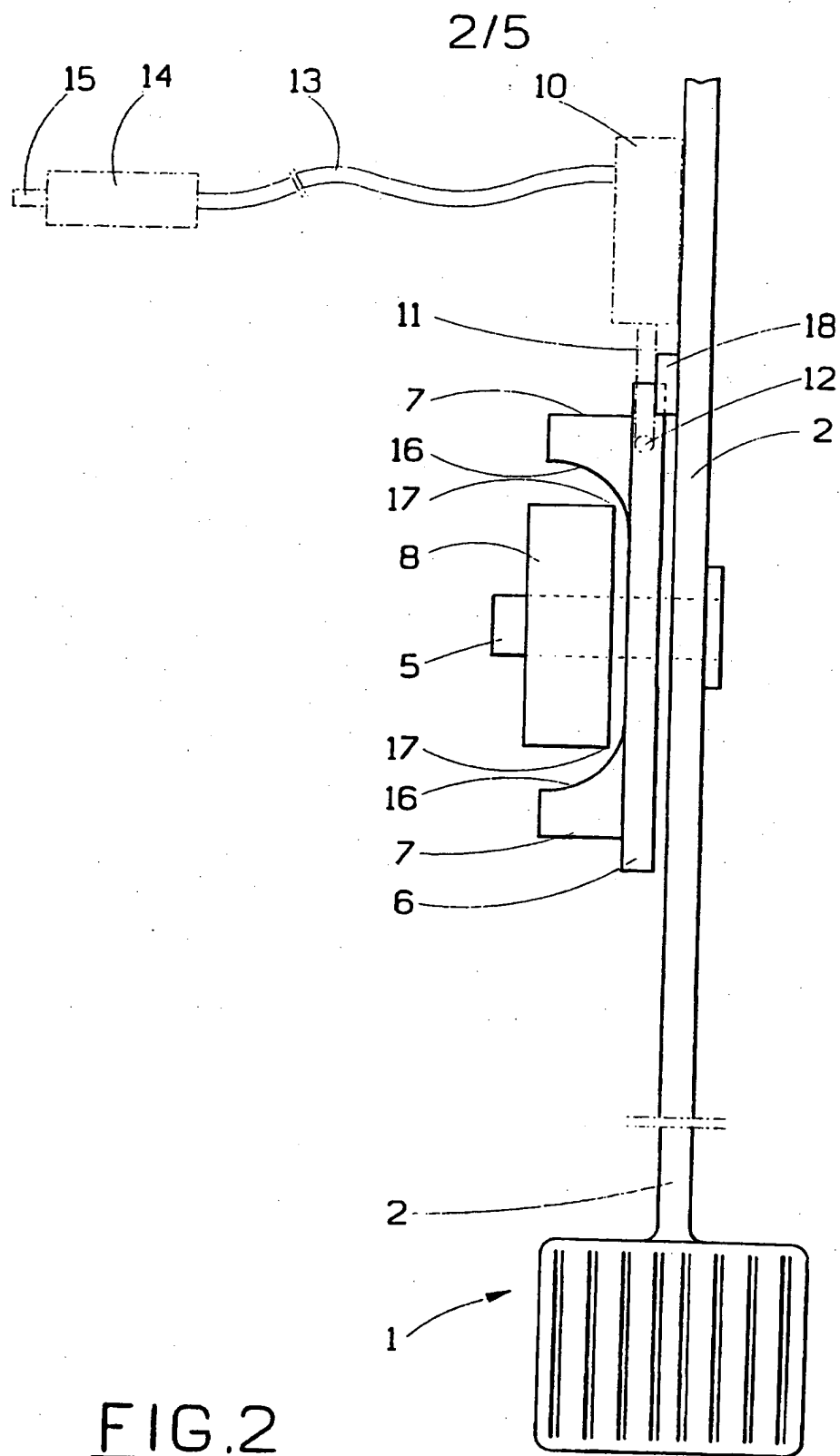
5 18. Arrangement according to any one of claims 9-17, characterized in that said cam surface (16) is curve-shaped or oblique relative to the plane of the pivoting element (6).

10 19. Vehicle comprising an arrangement according to any one of claims 9-18, characterized in that said sensor device (14, 15; 25) is arranged within a zone (41) in the front part of the vehicle in which a deformation takes place in the event of a head-on collision at a speed which exceeds a predetermined value.

15 20. A method in a pedal arrangement in motor vehicles comprising a console (4), a pedal arm (2) which is pivotally arranged in the console (4), and a push rod (8) which connects the pedal arm (2) with means (9) arranged to influence the pedal arm (2), which is pivotally arranged on a shaft (5) arranged on the pedal arm (2), characterized in that it comprises the following steps:  
20 activating an actuation means (10-5; 20-27; 31-38),  
pivoting a pivoting element (6) in the event of said  
25 activation, the pivoting element (6) being pivotally arranged on said pedal arm (2) and being provided with at least one cam surface (16) for interaction with at least one opposing surface (17) on said push rod (18), and  
30 guiding the cam surface (16) so that it causes said push rod (8) to be moved out of engagement with said shaft (5) before any part of the engine of said vehicle or any other component in the engine compartment affects the push rod (8).

1/5

FIG. 1



3/5

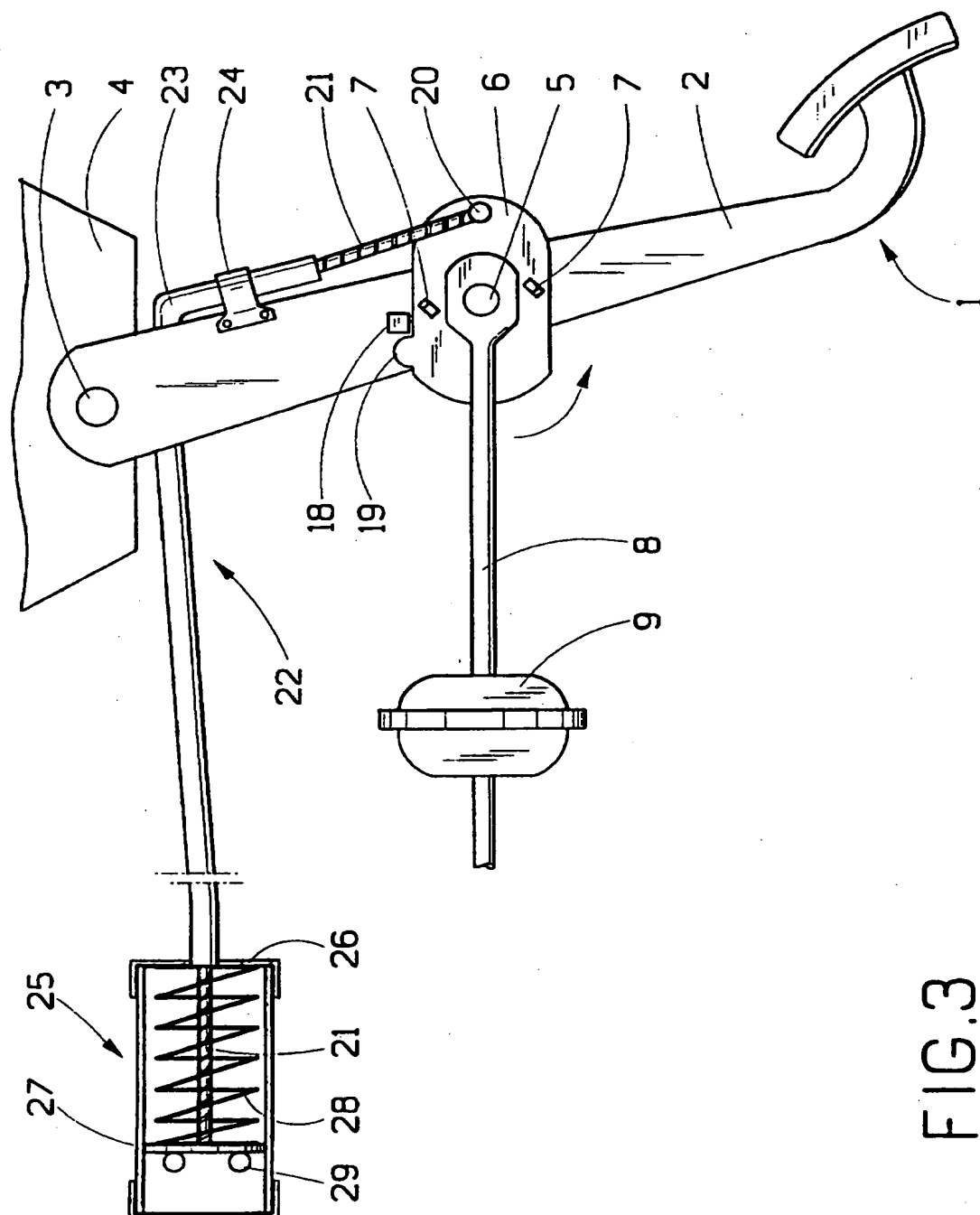


FIG. 3

4/5

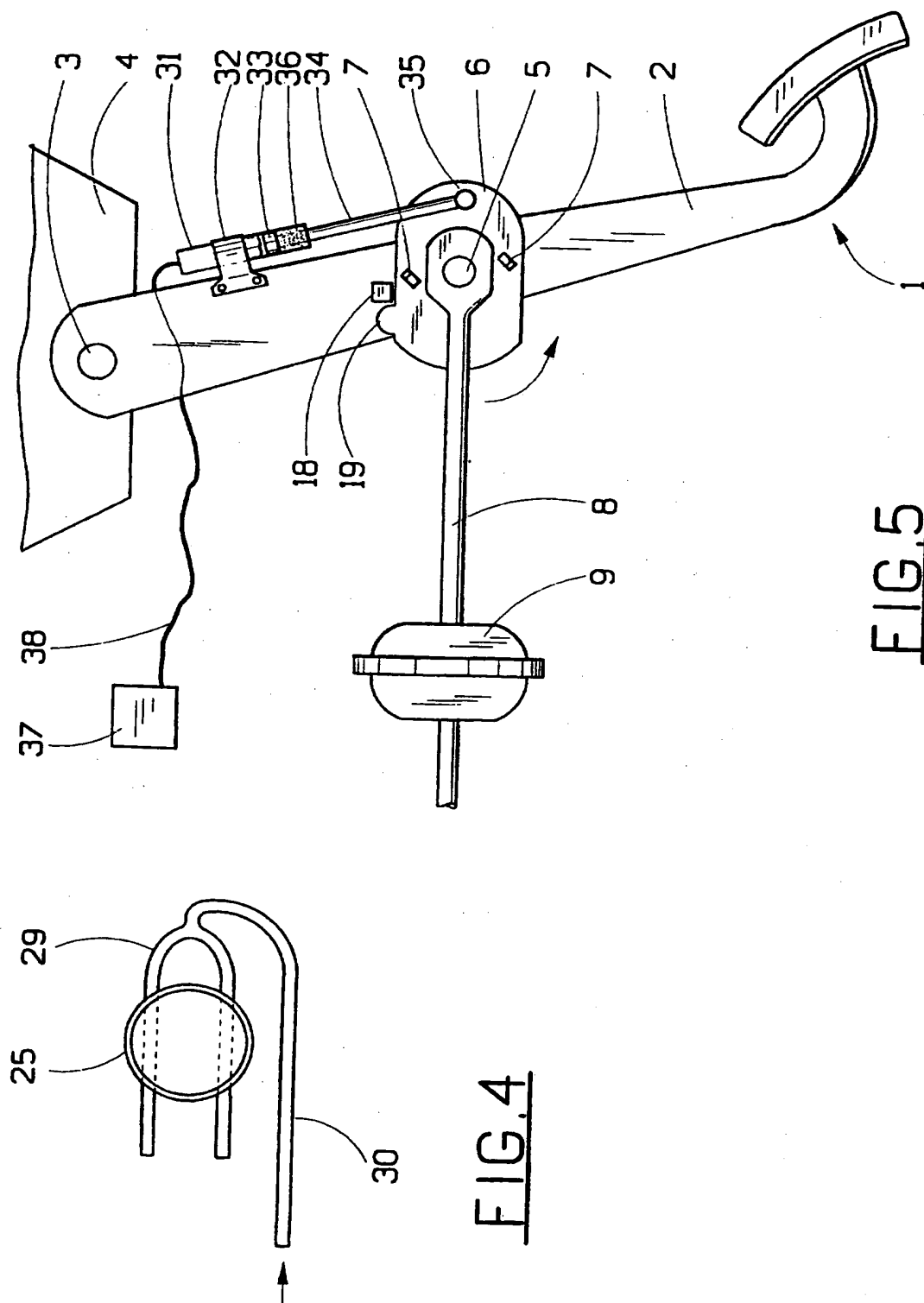
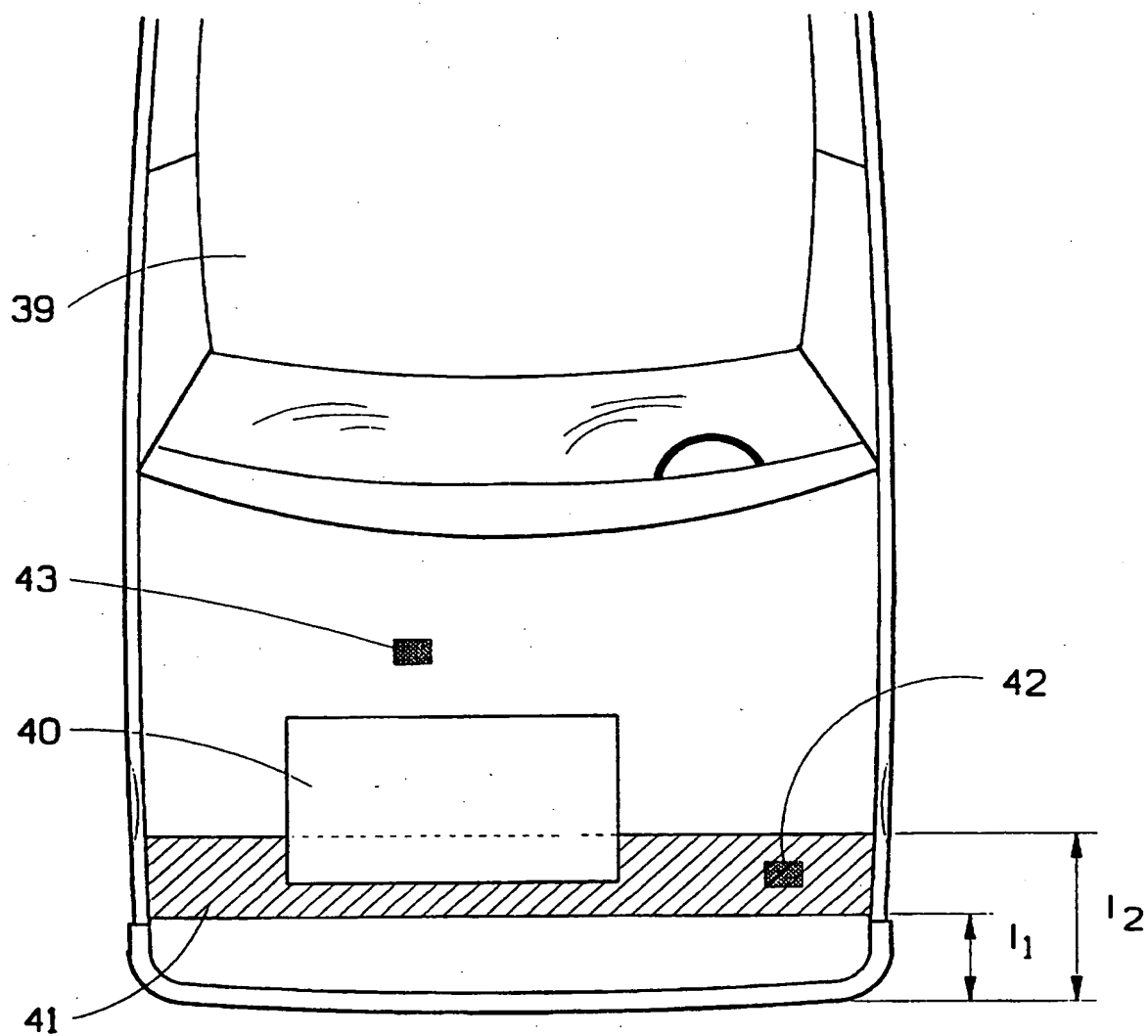


FIG. 5

FIG. 4

5/5

FIG. 6

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 97/00143

## A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B60T 7/06, B60R 21/09, B60K 23/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: B60T, B60R, B60K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

DIALOG: WPI

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 19515852 A1 (VOLKSWAGEN AG), 23 November 1995 (23.11.95), column 1, line 61 - column 2, line 5; column 3, line 39 - line 61	1-3,9,10
Y		4
A	--	11,14,21,22
Y	DE 3741881 A1 (VOLKSWAGEN AG), 28 July 1988 (28.07.88), column 3, line 44 - column 4, line 6	4
A	--	1-3,5-11, 14-17,21,22

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

\* Special categories of cited documents:

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"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

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Date of the actual completion of the international search

18 April 1997

Date of mailing of the international search report

28.04.97

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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 97/00143

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 4409285 A1 (VOLKSWAGEN AG), 6 October 1994 (06.10.94)  --	1-11,22
A	DE 2135151 A1 (DAIMLER-BENZ AG), 25 January 1973 (25.01.73)  -- -----	1-11,22

**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

04/03/97

International application No.

PCT/SE 97/00143

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 19515852 A1	23/11/95	NONE	
DE 3741881 A1	28/07/88	NONE	
DE 4409285 A1	06/10/94	NONE	
DE 2135151 A1	25/01/73	NONE	